

# Differential Effects of Full and Partial Notes on Learning Outcomes and Attendance

Tara L. Cornelius and Jamie Owen-DeSchryver  
*Grand Valley State University*

*Although college instructors are increasingly providing students with online notes, research is equivocal on how such notes affect student outcomes. This study examined partial versus full notes in introductory psychology classes while controlling for initial levels of student knowledge and academic ability. Results suggested that students receiving partial notes performed better on examinations later in the semester and on conceptual questions during the cumulative final examination than students receiving full notes. Students receiving full notes also self-reported more negative effects on attendance. We provide possible interpretations of these data and suggest areas for further investigation.*

As early as the 1920s, researchers examined differences among students based on their note-taking strategies and skills (Crawford, 1925). Experimental research has demonstrated that taking notes during lectures improves performance on free recall tasks (Fisher & Harris, 1973; Maqsdud, 1980) as well as on typical student outcome measures, including tests and final grades (Di Vesta & Gray, 1972; Kiewra, DuBois, Christensen, Kim, & Lindberg, 1989; Kiewra et al., 1991; Van Meter, Yokoi, & Pressley, 1994). However, the mechanism through which note taking facilitates learning in undergraduate students remains unclear. One possibility is that notes serve as an external memory device (Miller, Galanter, & Pribram, 1960). From this perspective, it is not the act of taking notes, but the availability of the notes for later review that results in student learning. Another possibility is that note taking encourages encoding of lecture material (Di Vesta & Gray, 1972; Pardini, Domizi, Forbes, & Pettis, 2005). Through the process of taking notes, students are able to personalize and reorganize information, a strategy that assists in encoding and elaboration. Fisher and Harris (1973) further suggested that note taking might serve both of these functions, as

these researchers demonstrated that recall was highest for students who both took and reviewed their notes.

Recent technological advances have significantly altered how students take notes in college classrooms. New technologies allow instructors to provide notes to their students via Blackboard ([www.blackboard.com](http://www.blackboard.com)) or other similar Web-based systems. This practice may allow instructors to provide more response opportunities for students, because instructors can use lecture time to engage and query students, rather than waiting for students to copy notes from overheads or slides (Austin, Lee, Thibeault, Carr, & Bailey, 2002). Simultaneously, when instructors provide lecture notes, students should have fewer transcription errors and omissions, which is important given research that has shown that students may fail to record up to 50% of relevant lecture information (Anderson & Armbruster, 1991). Additionally, students report that instructor-provided notes allow them to listen more intently during lectures by decreasing time spent “copying” information (Mantei, 2000).

Although research has suggested that students *perceive* that instructor-provided notes are useful to their learning and that they “like” having the handouts (Frey & Birnbaum, 2002; Pardini et al., 2005), the question remains as to whether these notes actually enhance learning outcomes. In a survey study on the use of instructor-provided notes, students reported that having access to notes contributed to procrastination in learning activities and hindered note taking during lectures (Pardini et al., 2005). Additionally, providing notes to students may encourage absenteeism if students do not perceive the benefits of class attendance (Potts, 1993). Results reported by both Murphy and Cross (2002) and Weatherly, Grabe, and Arthur (2002–2003) suggested that students with access to notes earned lower final grades than students

without access; however, the designs in both studies were confounded by the fact that the students may have differed from one another at the outset. Murphy and Cross identified groups based on self-described usage of instructor-provided notes, and Weatherly et al. compared students across semesters, leaving open the possibility that students in different semesters may have had varying levels of skill or that the timing of the class may have attracted different types of students. Despite these methodological issues, the collective results of these studies do suggest that instructor-provided notes may have a detrimental impact on student learning and thus indicate a need for thoughtful, well-researched approaches on how to best provide notes to students in college classrooms.

One aspect of instructor-provided notes worthy of close consideration is the degree of completeness of such notes. Instructors who choose to provide students with notes may offer full notes, including all lecture materials, diagrams, and content-based information, or they may choose to provide partial notes, where students receive an outline, guide, or incomplete framework into which they insert information while listening to the lecture. Although empirical research on this topic is limited, one recent study did suggest that given a choice, students preferred partial over full notes (Grabe, Christopherson, & Douglas, 2004–2005). This preference for partial notes may be important, as Annis (1981) suggested that students scored better on both essay and multiple-choice exams when they accessed partial notes or recorded their own notes as compared with when they received full notes. A more recent study by Vandehey, Marsh, and Diekhoff (2005) examined the differential effectiveness of student-generated notes, instructor-provided partial notes, and instructor-provided full notes on final grades and attendance. In this study, five different instructors used identical lectures and classroom activities, and researchers evaluated which of the note-taking strategies was most beneficial. Contrary to the hypotheses of the authors, results suggested that type of notes did not have a significant effect on either final grades or attendance.

### Rationale and Purpose of the This Study

Our study adds to the existing body of research assessing the impact of instructor-provided notes on learning outcomes for college students, while expanding the work of Vandehey et al. (2005) by addressing several variables that may impact final grades, includ-

ing general academic performance and prior knowledge of psychological principles. Due to concerns about students' perceptions of being "deprived" of notes or contamination across sections, we chose not to include a condition in which students did not receive any instructor-provided notes; thus we had two conditions: instructor-provided full notes (IFN) and instructor-provided partial notes (IPN). We hypothesized that students receiving partial notes would demonstrate better overall performance on examinations and final grades, as well as better class attendance. We also hypothesized that students receiving partial notes would score comparably higher on conceptual and application exam questions, because they elaborated on information through the act of taking notes. Furthermore, we expanded on previous research by maintaining the variability in content and outcome measures typically demonstrated in college teaching, controlling for instructor variables through both instructors teaching both experimental conditions, statistically controlling for prior knowledge and general academic ability, and examining student performance on different types of outcome measures, including test questions that assessed definitional knowledge and those that were conceptual or applied in nature.

## Method

### *Participants*

Undergraduate students ( $N = 307$ ) enrolled in four sections of introductory psychology participated in this study. Of the total sample, 153 students received IFN and 154 students received IPN. Participants were at least 18 years of age, enrolled in the authors' sections of the course, and signed a consent document to be included in the study. The sample consisted of 219 women and 88 men, with an average age of 18.64 (range = 18–38). The majority of participants were full-time students ( $n = 297$ ); employed ( $n = 158$ ); worked, on average, 9.02 hr a week; and listed their academic standing as freshmen ( $n = 218$ ). Approximately one third of participants identified their major as undeclared ( $n = 101$ ).

### *Implementation*

Of the four introductory psychology sections assessed, the first and second authors each taught two sections. We randomly assigned students from one section of the first author's course to IFN, and students in

the other section received IPN. To control for possible variation in the composition of students selecting courses in the morning versus afternoon, we balanced experimental assignment across time of day for the second author's sections; thus, students in the first author's morning section received partial notes, and students in the second author's morning section received full notes. Students assigned to the IFN condition received all the instructor notes, posted on Blackboard in Microsoft PowerPoint format; we instructed students to download these notes daily and bring them to all class sessions. Students assigned to the IPN condition received partial notes, consisting largely of headings and titles of definitions and concepts, which required students to add information to complete the notes. We also provided the partial notes on Blackboard in PowerPoint and instructed students to bring these notes to every class session. Class sizes and the number of class sessions were equivalent across conditions. Information acquired on the exit interview revealed that the majority of participants in both conditions (78.75% in IFN, 75.45% in IPN) downloaded and used the notes during most class sessions.

Students completed a basic demographic measure, a knowledge-based pretest of psychological concepts, and four exams. Students also participated in random attendance probes and completed an exit survey on their use of the instructor-provided notes. Additionally, we examined ACT scores to determine if there were any preexisting differences between students in

the four sections on this approximation of academic aptitude.

## Results

The primary dependent variables were grades on examinations, final grades, and attendance. We also evaluated exam scores, post hoc, because we speculated that performance on different types of examination questions (i.e., definitional vs. conceptual) might vary across the conditions of instructor-provided notes. Definitional questions were those questions that required rote memorization of factual or historical information. Conceptual questions were those that required application of a theoretical concept to an example that required additional mastery of the material beyond the definition.

To ensure that the two groups were roughly equivalent prior to the course, we assessed demographic characteristics and pretest performance measures. There were no statistically significant differences between the two groups on initial knowledge for psychological concepts (as measured by the pretest), age, gender, hours worked, credits, or years of college. However, there was a significant difference between groups on ACT scores, with students receiving IFN having higher average ACT scores,  $t(305) = -2.27$ ,  $p = .024$ , than students assigned to IPN, which was a small to medium effect ( $d = -.26$ ). Table 1 provides the means and

**Table 1. Descriptive Statistics for Dependent Variables and ACT Scores Across Groups**

Variable	Instructor-Provided Full Notes <sup>a</sup>		Instructor-Provided Partial Notes <sup>b</sup>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
ACT*	23.72	3.01	22.99	2.57
Exam 1 (Overall)	70.48	13.08	71.71	12.11
Conceptual	70.46	14.81	70.90	13.70
Definitional	71.04	14.93	72.87	14.42
Exam 2 (Overall)	71.73	12.85	72.36	9.46
Conceptual	68.78	14.78	70.31	11.86
Definitional	72.13	14.58	73.27	10.65
Exam 3 (Overall)*	72.84	19.44	75.83	11.10
Conceptual	74.51	14.10	75.53	12.59
Definitional	75.94	13.76	77.06	9.58
Exam 4 (Overall)*	74.39	19.23	77.11	12.21
Conceptual*	73.33	20.26	78.34	12.22
Definitional	75.15	19.41	76.76	12.56
Final grades*	77.38	14.20	79.69	8.85
Attendance	74.18	8.29	78.18	8.27

<sup>a</sup> $n = 153$ . <sup>b</sup> $n = 154$ .

\* $p \leq .05$ .

standard deviations of each of the dependent variables and ACT scores of each group.

We examined the relation between ACT scores and the dependent variables using Pearson correlation coefficients. ACT scores were significantly correlated with all outcome measures ( $r$  values ranged from .26 to .31 for exams and final grades,  $p < .001$  for all analyses). Because ACT scores were significantly correlated with all examination scores and final grades, we used ANCOVA, with ACT scores as the covariate, to analyze performance on examinations and final grades. This procedure controls for and removes variance already accounted for by the covariate, and because ANCOVA assumes homogeneity of regression, we also conducted homogeneity and linearity of slope tests. These tests revealed nonsignificant results, with interaction term partial  $\eta^2$  ranging from .003 to .017. Using ANCOVA, we analyzed each of the four examination scores to determine differences between the two groups. These analyses revealed nonsignificant results for Exams 1 and 2,  $F(1, 304) = 2.73$ ,  $ns$ ;  $F(1, 304) = 1.51$ ,  $ns$ , but significant differences for Exam 3 and Exam 4,  $F(1, 304) = 5.45$ ,  $p = .02$ ;  $F(1, 304) = 5.05$ ,  $p = .025$ , with students assigned to IPN scoring better on these two exams compared to students assigned to IFN. Partial  $\eta^2$  and Cohen's  $d$  indicated small to medium effect sizes for both Exam 3 and Exam 4 ( $\eta^2 = .018$ ,  $d = .20$ ;  $\eta^2 = .016$ ,  $d = .22$ , respectively).

Examination questions were classified as definitional or conceptual according to the test bank from which they were derived, or in cases where the instructor created the examination question, both the instructor and a student research assistant conferred to designate questions as conceptual or definitional. We calculated student performance on examinations for the two domains of questions and used ANCOVA to determine differences between students in the IFN group and students in the IPN group on conceptual and definitional questions. The results revealed no statistically significant differences between those domains of questions for any of the unit examinations. However, on the final examination, Exam 4, students assigned to IPN scored significantly better on conceptual questions than students in the IFN group,  $F(1, 302) = 12.21$ ,  $p = .001$ . Both partial  $\eta^2$  and Cohen's  $d$  indicated a medium effect ( $\eta^2 = .033$ ,  $d = .30$ ).

We also conducted ANCOVA on the final course grades to determine if students in the IFN and IPN groups earned significantly different grades in the course. We designed the courses such that different types of classroom activities (in-class assignments, homework, etc.) received the same relative weight in

the grading system to ensure that course grades across the two instructors were made up of the same types of assignments valued at the same worth. Results revealed that students assigned to IPN performed significantly better in the course,  $F(1, 304) = 6.21$ ,  $p = .013$ , than students assigned to IFN. Both partial  $\eta^2$  and Cohen's  $d$  indicated a small effect ( $\eta^2 = .020$ ,  $d = .19$ ).

To determine the effect of type of notes on attendance, we conducted an independent samples  $t$  test on the random attendance probes taken throughout the semester. A research assistant unobtrusively collected attendance data for 20% of class periods on dates that we randomly selected from all possible class sessions. We then analyzed attendance data to determine differences between IFN and IPN on class attendance. Although students in the IPN group evidenced higher average attendance, this difference was not statistically significant,  $t(26) = 1.50$ ,  $p = .14$ . On the exit survey, although the majority of students in both IFN and IPN groups indicated that the notes did not adversely affect their attendance in the class, more students in the IPN group endorsed the statement "The notes did not affect my attendance" (82.95%) than did students in the IFN condition (68.75%). This was a statistically significant difference,  $\chi^2(1, N = 297) = 11.56$ ,  $p = .001$ , with  $\phi = .20$  indicating a small to medium effect.

Although not directly related to our research questions, students also completed measures to determine the utility and social validity of the notes. In the IFN condition, 92.25% rated the notes as very or moderately useful, whereas 85.15% rated them similarly in the IPN condition. Students in both courses indicated that they regularly used the notes during lectures to help with note taking (78.75% in IFN; 70.45% in IPN). Neither of these differences were statistically significant,  $\chi^2(1, N = 297) = 2.66$ ,  $ns$ ;  $\chi^2(1, N = 297) = .57$ ,  $ns$ . In addition, one question on the exit interview assessed possible contamination or "sharing" of the notes across sections to determine if there were threats to internal validity. The majority of students in both sections stated that they "never shared or borrowed notes from another section of PSY 101" (86.7% in IFN, 72.5% in IPN). This difference was statistically significant,  $\chi^2(1, N = 297) = 8.52$ ,  $p = .004$ , with  $\phi = .17$  indicating a small to medium effect.

## Discussion

The purpose of our study was to determine the differential effect of type of instructor-provided notes on

examination grades, final grades, and attendance. Contrary to Vandehey et al. (2005), our results provided some support for the hypothesis that partial notes led to better performance, particularly on cumulative conceptual questions and final grades. Although the effect was small, students assigned to the IPN condition performed significantly better on Exam 3 and on the cumulative final exam (Exam 4) than students in the IFN condition. No statistically significant differences emerged on the first two examinations. Students in the IPN group also earned significantly higher course grades than their counterparts in the IFN group. We did not find differential effects of note type on class attendance, although the data suggested that students in the IFN condition were more likely to self-report that having access to the notes affected their attendance.

The data on examination performance suggested that initially, type of notes did not lead to significant differences in exam scores. However, as the semester progressed, students receiving IPN outperformed students receiving IFN on examinations, including the final exam. There are several possible explanations for these findings. First, it is possible that as the semester progressed, because the students in the IFN condition had all the lecture material, they relied more on the notes and stopped engaging in other behaviors to facilitate learning (e.g., taking additional notes, attending to lecture, reading the textbook) whereas students in the IPN condition had to continue to engage in those behaviors to acquire the material to complete their notes. Perhaps at the beginning of the semester, all students engaged in adaptive study behaviors, but as the semester progressed, those behaviors declined for students who already had all the requisite material contained in their notes.

An additional explanation for these findings may be that students entering college for the first time may be ill-equipped in terms of study habits and, after performing poorly on the first few exams, may increase their study behaviors. Our data are consistent with this hypothesis; in all four courses, the exam scores were lowest for the first exam and gradually improved over the course of the semester. It may be that students in the IPN condition are better able to improve their study behaviors because of the encoding function of notes. For instance, when students finally do become a bit “panicked” by their low exam scores after the second test and begin studying, they perform better with the partial notes because they have encoded information better with these notes. Students assigned to the IPN condition also averaged higher final grades in the course, although these data were confounded by their

better performance on the last two examinations in the course, relative to those in the IFN condition. In sum, these findings may suggest that instructors can facilitate active note taking by providing students with partial notes, because providing incomplete notes encourages students to elaborate on and encode material during the lecture. Consequently, student scores on examinations and, ultimately, the grade earned in the course may be affected.

An interesting finding in this study was the differential performance of students on conceptual questions on the final examination, although not on any of the previous examinations. We speculate that this differential performance on conceptual questions may relate to the active nature of the IPN condition relative to the amount of information presented in a cumulative final examination. The final examination required understanding of a large amount of material, and it may be that students with partial notes had been encoding information throughout the semester, rather than just memorizing notes and definitions. On a test that required knowledge of a large number of concepts, rote memorization was not feasible, so students who encoded the information by actively taking notes throughout the semester may have performed better because they had experienced better conceptual understanding.

Our study failed to find a significant difference in attendance between students assigned to IPN compared to IFN, although there was a trend toward significance. We assessed attendance via probes during 20% of the lectures; thus it is possible that the failure to find a difference was the result of low power to detect a difference between the two groups, rather than a lack of difference. A post hoc analysis of power at  $\alpha = .05$  estimated power at .314 and suggested that at least 22 probes for each class would have been necessary to reach significance given the difference evidenced in our sample. In future studies, researchers may choose to assess attendance more regularly and rigorously to determine if, in fact, a difference exists in attendance across note conditions. Interestingly, students assigned to use IFN were significantly more likely to report that the notes adversely affected their attendance in class compared to those using IPN. Thus, student *perception* data indicated that attendance may have been negatively impacted by providing full Web notes. Although our empirical data failed to demonstrate this difference, our data do suggest that instructors should use caution in providing highly detailed notes to students if attendance in class is important.

In general, our study provided support for the encoding theory of notes, in that through the process of taking notes, students gain some mastery of the material. Additionally, the results suggested that instructors should be cautious in providing full notes to students, even when students often state that they prefer these notes. Providing notes to students may be desirable in terms of what they say they want, but appears to have an adverse effect, especially on conceptual or application types of outcome measures. If the intent of college teaching is to help students master the material and facilitate higher level learning, then providing full notes appears to be inhibiting these processes. Partial notes, therefore, may provide a nice balance in terms of providing students with some notes, which they report as helpful, and still requiring encoding and higher level processing of information, which will ultimately improve learning and performance.

### Limitations and Recommendations

Future research may be able to address a variety of weaknesses in our study. Our sample was composed primarily of first-semester freshmen enrolled in a general education course, which, although providing a window into possible deficits in study-behavior repertoire, prevented analysis of how behaviors change as one progresses in college. Future researchers may consider examining upper level and major-specific courses to determine the effects of such notes on performance in different domains. Additionally, the sample was composed primarily of female students; although this is not atypical of psychology courses, it limits the generality of these findings.

This study was also limited by the cursory nature of some of the outcome data. As mentioned previously, future researchers should consider other means of assessing attendance to provide a more sensitive and more statistically powerful means to determine differences between groups. Additionally, this study used traditional outcome measures of tests and grades, with a small variation of examining performance on conceptual and definitional questions on those outcome measures. Future researchers may consider using other, perhaps more dynamic, measures of learning that recognize that differences may exist between types of outcome measures, including but not limited to conceptual, application, definitional, and analysis types of outcomes. A useful model for this type of analysis appeared in Neef, McCord, and Ferreri (2006).

Finally, data from the exit survey suggested that anywhere from 15% to 28% of students reported sharing notes with individuals from another section of introductory psychology. The nature of the exit survey prevented us from determining whether these students were sharing notes with individuals from the same instructor's other section, thus contaminating the independent variable. Even though only a minority of students reported sharing notes, the students who did share notes may have inadvertently contaminated the integrity of the experimental assignment. Future researchers should recognize this potential problem with online access to instructional material. With advances in information technology, printing an extra copy of notes is much less arduous than other methods, such as making another photocopy of notes at the library. The ease of online access, with its availability 24 hr a day, may also contribute to other poor study behaviors, including cramming and last-minute completion of course material, which would be an additional fruitful area of study. It is our hope that this research serves as a jumping-off point for future research designed to both address limitations of this project and expand it to other areas of teaching in psychology.

### References

- Anderson, T. H., & Armbruster, B. B. (1991). The value of taking notes during lectures. In R. F. Flippo & D. C. Caverly (Eds.), *Teaching reading & study strategies at the college level* (pp. 166–194). Newark, DE: International Reading Association.
- Annis, L. F. (1981). Effect of preference for assigned lecture notes on student achievement. *Journal of Educational Research*, 74, 179–182.
- Austin, J. L., Lee, M. G., Thibeault, M. D., Carr, J. E., & Bailey, J. S. (2002). Effects of guided notes on university students' responding and recall of information. *Journal of Behavioral Education*, 11, 243–254.
- Crawford, C. C. (1925). Some experimental studies of the results of college note-taking. *Journal of Educational Research*, 12, 379–386.
- Di Vesta, F. J., & Gray, G. S. (1972). Listening and note taking. *Journal of Educational Psychology*, 63, 8–14.
- Fisher, J. L., & Harris, M. B. (1973). Effect of note taking and review on recall. *Journal of Educational Psychology*, 65, 321–325.
- Frey, B. A., & Birnbaum, D. J. (2002). *Learners' perceptions on the value of PowerPoint in lectures*. Pittsburgh, PA: University of Pittsburgh. (ERIC Document Reproduction Service No. ED 467192)

- Grabe, M., Christopherson, K., & Douglas, J. (2004–2005). Providing introductory psychology students access to on-line lecture notes: The relationship of note use to performance and class attendance. *Journal of Educational Technology Systems*, 33, 295–308.
- Kiewra, K. A., DuBois, N. F., Christensen, M., Kim, S-I., & Lindberg, N. (1989). A more equitable account of the note-taking functions in learning from lecture and from text. *Instructional Science*, 18, 217–232.
- Kiewra, K. A., DuBois, N. F., Christian, D., McShane, A., Meyerhoffer, M., & Roskelley, D. (1991). Note-taking functions and techniques. *Journal of Educational Psychology*, 83, 240–245.
- Mantei, E. J. (2000). Using Internet class notes and PowerPoint in the physical geology lecture. *Journal of College Science Teaching*, 29, 301–305.
- Maqsd, M. (1980). Effects of personal lecture notes and teacher-notes on recall of university students. *British Journal of Educational Psychology*, 50, 289–294.
- Miller, G. A., Galanter, E., & Pribram, K. H. (1960). *Plans and the structure of behavior*. New York: Holt.
- Murphy, T. M., & Cross, V. (2002). Should students get the instructor's lecture notes? *Journal of Biological Education*, 36, 72–75.
- Neef, N. A., McCord, B. E., & Ferreri, S. J. (2006). Effects of guided notes versus completed notes during lectures on college students' quiz performance. *Journal of Applied Behavior Analysis*, 39, 123–130.
- Pardini, E. A., Domizi, D. P., Forbes, D. A., & Pettis, G. V. (2005). Parallel note-taking: A strategy for effective use of Webnotes. *Journal of College Reading and Learning*, 35, 38–55.
- Potts, B. (1993). Improving the quality of student notes. *ERIC/AE Digest*. Washington, DC: ERIC Clearinghouse on Assessment and Evaluation. (ED 366645)
- Vandehey, M. A., Marsh, C. M., & Diekhoff, G. M. (2005). Providing students with instructors' notes: Problems with reading, studying, and attendance. *Teaching of Psychology*, 32, 49–52.
- Van Meter, P., Yokoi, L., & Pressley, M. (1994). College students' theory of note-taking derived from their perceptions of note-taking. *Journal of Educational Psychology*, 6, 328–338.
- Weatherly, J. N., Grabe, M., & Arthur, E. I. L. (2002–2003). Providing introductory psychology students access to lecture slides via Blackboard 5: A negative impact on performance. *Journal of Educational Technology Systems*, 31, 463–474.

## Notes

1. This study was supported by a grant from the Faculty Teaching and Learning Center at Grand Valley State University.
2. Send correspondence to Tara L. Cornelius, Grand Valley State University Department of Psychology, Allendale, MI 49401; e-mail: cornelta@gvsu.edu.

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